"Born Anew" Versus "Born Again"

Bruce Murray

Albert D. Wheelon's thoughtful analysis, originally presented July 15, 1986, establishes many crucial points. First, NASA's total concentration on a "Shuttle-only" program led to the disastrous current state of the United States' space program. Wheelon is right in stating that the United States must now use its disarray to good purpose by restructuring the national space program to use the Shuttle and its astronauts solely for those activities that genuinely require the presence of humans in space. All other payloads and launch vehicle systems must be free to utilize automated means, which are generally cheaper and more flexible. Objective application of this criterion will drastically reduce the number of Shuttle launches required. Thus, Wheelon's analysis leads to the conclusion that there is no need to procure another Shuttle Orbiter to replace Challenger or to complete and operate the second Shuttle launch site at Vandenberg Air Force Base in California. Second, Wheelon eloquently points out the fallacy of NASA's new focus on a Space Station as the central element for future civilian space efforts. NASA is repeating the underlying error of the past—namely, constructing U.S. civil space infrastructure upon the erroneous policy that the human *must* be part of nearly every significant civil space function (unlike the Soviets who maintain vigorous and separate manned and unmanned programs). Third, Wheelon correctly emphasizes that the overriding, immediate need of the United States' space program is for practical and cost-effective expendable launch options for military payloads, for communications satellites, and for space science and applications payloads. Fourth, the "Shuttle-only" program has indeed, as he asserts, dissipated the United States' once unchallenged leadership in planetary exploration, reducing it now to, at best, a fading coequal. Broad domestic political and popular support for planetary exploration has not been effectively translated over the last decade into new exploratory space missions because of NASA's competing priority for use of the manned Shuttle as an (inappropriate) launch vehicle for unmanned deep space missions.

This article is contribution no. 4431 of the Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California.

Bruce Murray is Professor of Planetary Science at the California Institute of Technology.

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Unfortunately, Presidential decisions about NASA, made subsequent to Wheelon's July 15 paper, indicate that the lessons highlighted by the Challenger explosion have only been partly assimilated by the White House. Military space payloads have indeed been released from the artificial launch restraints imposed since 1972 by the "Shuttle-only" national policy. The Department of Defense is once again able to carry out military space activities in a cost-effective manner. The White House also directed NASA to get out of the commercial launch business (a move that Wheelon feels will cripple U.S. commercial competition). These really have only been White House budget decisions, not major policy decisions. The military has been freed to spend its space budget as it wishes, and NASA's subsidy of commercial launches has been proscribed. Sadly, no real goals or directions have been set for NASA itself.

Space science and applications efforts, unfortunately, remain chained to the fallacies of the 1970s. NASA continues to avoid objective consideration of expendable launch vehicles for major space science and planetary exploration missions. "Forced busing in space" remains the policy for those activities NASA still controls financially, such as space science.

President Reagan's decision to build a fourth Orbiter over a peculiarly long time scale means that it cannot help to alleviate the present serious shortage of launch vehicles for military and commercial purposes. By the time the fourth Orbiter becomes available, expendable launch vehicle systems will be widely available and used for all high-priority military and commercial needs. For what critical national purpose, then, is the extra Orbiter so desperately needed?

In addition, the White House has opted to retain the Vandenberg launch capability, although in a nonoperational status. The reactivation of Vandenberg is tied to the completion of the fourth Orbiter, seemingly a case of one bad decision leading to another. Thus, to the already excessive costs per flight intrinsic to the Shuttle in the 1990s, we must add 2 to 3 billion dollars for the fourth Orbiter and 300 to 400 million dollars more per year for reactivating Vandenberg.

There is no conceivable scenario in which such expenditures will be cost-effective compared to use of expendable launch vehicles in the same time period. NASA is once again on the path toward financial disaster. The fourth Orbiter and Vandenberg decisions mainly served to relieve politically a White House baffled by trying to reconcile Reagan's instinctive support for manned space flight with economic and technical reality.

Now, freed from any Presidential requirement to provide a logical, cost-effective, and internationally competitive space program (which might have been a plausible outcome of the national questioning after Challenger), NASA has reverted to its 1970s view of Shuttle and Space Station as goals in their own right. There has been no serious national debate as to the functional utility of a Space Station nor any dispassionate evaluation of the significance to U.S. plans of the Soviet MIR Space Station capability. The Soviet Union now has a ten-year lead in obtaining whatever benefits a Space Station offers. Most seriously, the President has not linked the Shuttle/Space Station concept to any future U.S. commitment to send astronauts to Mars or to some other equally adventurous and historic activity. In the absence of long-term direction and critical review, NASA continues to survive by brokering superficial slogans (and big budget programs) among Congressional special interests.

Unfortunately, the NASA post-Challenger program that has evolved in the last six months is a born again *1970s* version, not the born again *1960s* concept Wheelon advocates. This NASA direction is inefficient and financially wasteful and—unless soon reversed—will doom the United States to second-rate status in civilian space activities well into the next century.

What the U.S. President must do is establish a compelling destination for Americans in space. The next significant benchmark will be the first human landings on Mars. This is a logical goal for U.S. manned flight if targeted during the first quarter of the next century. The manned Mars flight would vitalize civilian space generally and rationalize the time scale and character of the Shuttle and Space Station programs.

In a recent article entitled "Whither America in Space?" (*Issues in Science and Technology*, March 1986), I advocated serious consideration of a joint Soviet/U.S. first human flight to Mars. I argued that Apollo moon competition served the United States' national interests in the Sputnik-dominated early 1960s, but that a similar Apollo-type competition to Mars with the Soviets now, when total U.S. space assets and technologies (including SDI) are vast, would not serve the same national purpose nor command comparable political support. In contrast, the national and international political significance of a joint Soviet/U.S. long-term space endeavor of imaginative and peaceful character could well yield national security benefits comparable to those of Apollo. A world—and an American people—weary and disheartened by stale nuclear slogans and by the expensive strategic weapons programs of both superpowers could not fail to be convinced that a new era in the superpower

relationship was at hand. Recent progress by U.S. and Soviet negotiators on renewing a Cooperation in Space agreement emphasizes the political timeliness of considering such a goal.

Wheelon expresses concern over the difficulty of collaborating with the Soviets on any major, long-term endeavor. However, it is possible to organize most of the development effort for a future manned Mars mission around complementary aspects of the *existing* national space programs of the two countries. For example, the Soviets have had enduring interest in long-term human flight and in Space Stations—first Salyut and now MIR. A key development for the human flight to Mars will probably be very large spinning cruise modules to provide to crews mild but adequate amounts of artificial gravity during the two to three years of space travel involved in planetary round trips. The development of such giant habitats would be a logical extension of the existing Soviet manned flight program. Such an interplanetary cruise module could be developed in steps by the Soviets right up to the actual Mars flight units being first tested and then operated for years in Earth orbit.

In parallel, the United States might develop the technology and space infrastructure necessary for a very large propulsion system to be assembled and fueled in orbit. Such mammoth propulsion systems will be required for round-trip human flights to the surface of Mars. This long-term development activity by the United States would be consistent with our self-selected Shuttle focus and would provide some needed direction for the Space Station development as well.

Like the spinning habitat development, the giant orbit propulsion system lends itself to a staged development in Earth orbit over many years. The Mars descent and ascent systems can be developed much later by either or both countries.

In such a joint Man-to-Mars scenario, if either partner were to withdraw from the collaborative effort, the remaining partner could develop the missing technology on its own and carry out a unilateral mission at a later date. Thus, if both countries intend to go to Mars eventually anyway, substantial political, cost, and schedule benefits may accrue for both partners in a joint program. And at least the early portions of such a hypothetical U.S./Soviet manned Mars endeavor can be organized in such a way that neither side would be hostage to withdrawal on the part of the other. A further inhibition to withdrawal would be the likely presence of other spacefaring nations as

junior partners on the project. Withdrawal by either superpower in a broad international endeavor would create a political strain with allies as well as adversaries.

For well over a decade, the United States has been living in a self-contained "Cinerama" fantasy, nourished by repeated assertions that Shuttle development would make space safe, easy, and inexpensive. Challenger demonstrated tragically that space flight is far from safe. The decline of other elements of our national space program *even prior to that time* painfully illustrated that the Shuttle is neither effective nor cheap as a general space transportation system.

The United States has not been competing *or* collaborating in space. Instead, it has been treating civilian space as a domestic political football to be brokered in Congress along with other nonessential, discretionary activities; domestic perceptions, rather than sustained competitive achievements, were all that really counted.

If the United States is to return once again to greatness in space, it will begin when an effective President credibly links new civilian space activities to our future world status. Rather than seeking an elusive "born again" reappearance of the particular technical, political, and international circumstances of the 1960s, the United States should anticipate a chance for its space efforts to be "born anew" as part of a more mature relationship among the superpowers and the other nations of the world.